

# Improving AIRS Simulations

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## The Problem

AIRS forward models (IR, Microwave, Vis) use different assumptions in their treatment of:

- Transmissive clouds
- Cloud overlap
- Cloud microphysics
- Cloud vertical structure
- Scale of horizontal variability

Given the multi-spectral nature of many AIRS retrievals, the effect of these inconsistencies must be evaluated. Improved forward models can aid algorithm development and will be more useful in interpreting operational data.

## Proposed Solution

Alter Truth Files and forward models to address the five “problem” items. Include improvements recently proposed by Team Members, but now with due consideration for consistency between wavelength regions.

- Allow for transmissive clouds in the IR forward model
- Various changes to Level 2 Truth Files
  - Explicitly set cloud overlap
  - Each cloud layer’s vertical structure derived from condensate profile
  - Include information on cloud microphysics
  - Use ancillary file with information at Vis resolution
- Allow IR and microwave forward models to include cloud microphysics and scattering

For details, see Science Design File Memo ASDF-0023-1997-MDH.

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## Other Simulation Improvements

- **Aerosols.** The visible simulation incorporates aerosols (dust, sea spray, etc.) based on surface type. Their effect on IR radiances must be determined. Possible models to use as our standard are the ones contained in the visible forward model (SBDART), or ones developed at JPL for the MISR instrument.
- **Surface variability.** The IR and microwave simulations will need to incorporate sub-footprint scale surface variations (available in the Truth File at Vis resolution). This is crucial for development of the surface inhomogeneity algorithm!

## Open Issues

- **How is the work done?** Will these changes be made as part of the current “standard” software effort, or should they be explored in a parallel “research” effort?
- **Who does the work?**
  - Truth File modifications handled at JPL (S.Y. Lee)?
  - IR forward model modified by Goddard (Susskind/Barnet) and JPL (Hofstadter/Lee)?
  - Microwave forward model modified by MIT (P. Rosenkranz)?
  - Visible forward model modified by Santa Barbara (Gautier/Yang) and JPL (Hofstadter)?